

Middlefield Wireless Broadband Project Costs

Towers & poles	\$	160,000
Network equipment	\$	174,500
Customer Premises Equipment	\$	92,125
Network Infrastructure	\$	17,436
Project Management	\$	70,000
Total	\$	514,061
<i>Planned 2017 Upgrades</i>	\$	45,500
<i>Total After Upgrades</i>	\$	559,561

Middlefield Wireless Broadband Capital Budget

	Material price	Labor price	Class	Qty	Materials	Install	Total	Notes
50' wood poles (42' up)	\$2,000	\$1,000	t	12	\$24,000	\$12,000	\$36,000	
80' wood poles (65' up)	\$4,000	\$2,000	t	2	\$8,000	\$4,000	\$12,000	
90' monopoles (90' up)	\$18,000	\$10,000	t	4	\$72,000	\$40,000	\$112,000	e.g. Rohn DEP90HA
Lit sites/cabinets	\$2,500	\$1,000	e	18	\$45,000	\$18,000	\$63,000	Switch, batteries, etc.
Sites w/5GHz A5	\$1,000	\$200	e	8	\$8,000	\$1,600	\$9,600	A5-360 all directions
Sites w/2.4GHz			e	8				No multi-sector option
Sites w/TVWS	\$6,000	\$250	e	8	\$48,000	\$2,000	\$50,000	if multi-sector APs used
5 GHz sectors	\$	\$	e	15	\$	\$	\$	If not A5-360
2.4 GHz sectors	\$1,350	\$150	e	13	\$17,550	\$1,950	\$19,500	
TVWS sectors	\$	\$	e	13	\$	\$	\$	If single sector APs
TVWS sector antennas	\$300	\$100	e	13	\$3,900	\$1,300	\$5,200	With either type of AP
Backhaul radios	\$600	\$200	e	34	\$20,400	\$6,800	\$27,200	Point-to-point pairs
Total					\$246,850	\$87,650	\$334,500	

t total \$104,000 \$56,000 \$160,000 Towers
e total \$142,850 \$31,650 \$174,500 Field network equipment
\$211,025 \$62,600 \$266,625 Network+CPE eq. total

Switches

true or false

Use Mimosa A5-360? **TRUE** one box, four sectors, antennas (vs. Ubiquiti)
Use multi-sector TVWS AP? **TRUE** one box, enough sectors
Use PMP450 for 2.4 GHz? **TRUE** (vs. Ubiquiti) total AI 29

5 GHz subscribers 53 31%
2.4 GHz subscribers 60 35%
TVWS subscribers 60 35%
total 173 at 60% take rate

Budgetary equipment; not final choices

	Material	Install			
Mimosa A5-360 AP	\$1,000	\$200			
UBNT 2 GHz sector	\$250	\$150			
Cambium PMP450 AP	\$1,350	\$150			
Single sector 5G	\$250	\$150			
Single sector TVWS	\$3,500	\$250			
Multi-sector TVWS	\$6,000	\$250			
TVWS sector antenna	\$300	\$100			Antennas extra (installed w/sector)
Backhaul radio	\$600	\$200			Average
5G SM	\$200	\$150	20	\$4,000	Inc. h/w, demarc Wi-Fi
2.4G Ubiquiti SM	\$175	\$150	10	\$1,750	Inc. h/w, demarc Wi-Fi
PMP450 SM	\$375	\$175			Connectorized + antenna
TVWS SM	\$450	\$175	15	\$6,750	Inc. external antenna
				\$12,500	

Note: Subscriber Module installation is average of low-cost "standard" and some high-cost "customized" efforts

Planned subscribers

Total houses 289
Take rate 60%
Total take 173

CPE by band			Sub per sector	Spare SMs	SM cost	Install	Total
Subscribers in 5G range	53	31%	3.5	3	\$11,200	\$7,950	\$19,150
Subscribers in 2G range	60	35%	4.6	3	\$23,625	\$10,500	\$34,125
Subscribers using TVWS	60	35%	4.6	3	\$28,350	\$10,500	\$38,850
Total	173		4.2		\$63,175	\$28,950	\$92,125

Network Infrastructure

		h/w	labor	total
Core routing/switching		\$5,000	\$2,000	\$7,000
Spare common equipment	3%			\$4,436
Fiber extension to transfer station				\$6,000
Total				\$17,436

Project Management

Design/engineering/integration	\$20,000
Administrative[1]	\$50,000
Total	\$70,000

[1] Includes oversight, RFPs, MLP operation, project management, tower siting paperwork, marketing, etc.

Total initial project including pilot	\$514,061
Total CapEx/subscriber	\$2,971

Middlefield Wireless Broadband 2017 Upgrades

Planned 2017 Upgrades

	Material	Installation	Total
Backhaul upgrades (2017)	\$7,500	\$2,500	\$10,000
LTE upgrade eq. (3 sites)	\$18,000	\$2,500	\$20,500
LTE CPEs (50)	\$10,000	\$5,000	\$15,000
Total	\$35,500	\$10,000	\$45,500

Middlefield Wireless Broadband Access Sectors

Enabled sites	Lat (°)	Long (°)	Elev (m)	Ht (ft)	Access sectors				
					TVWS	2 GHz	5 GHz	Backhl	Total
Alderman Rd	42.3287	-73.0033	465.5	90	2	2		3	7
Becket Bridge (Bancroft)	42.309	-73.0272	270	42		2		1	3
Chipman S	42.3491	-72.9902	418	42		2		1	3
ClarkWright	42.3496	-72.9678	332.2	65	2	1		2	5
East River S	42.3624	-72.9678	287	42	1			1	2
Skyline	42.362	-73.032	487.8	90			2	3	5
Skyline N	42.3718	-73.039	494.5	42	2			1	3
Town Hall	42.3446	-73.0094	506	30			1	1	2
TownHill Rd.S	42.3362	-73.0306	393.6	42		1	1	1	3
Chipman Near Root	42.3621	-72.9942	485.8	90	2	2	2	3	9
Transfer Station	42.3499	-73.0119	520.5	100	2		3	7	12
WASH: Middlefield Rd	42.3481	-73.0694	472	42		1		1	2
Chester Rd.	42.3277	-72.9989	423.4	42			2	1	3
Cone Rd.	42.3719	-72.9829	434.5	47	1			1	2
HPease&TownHill	42.3478	-73.0233	466	65	1	2	2	1	6
<i>Contingency site</i>				42			2	2	4
Relay-only sites:									
BCKT:Surriner Rd	42.3063	-73.0397	356.3	42				2	2
East River bend	42.3711	-72.9665	272.5	42				2	2
Total Sectors					13	13	15	34	75
(Subscriber sectors)	41								
<i>Optional MBI access</i>									
WRTH: Old North@River	42.4236	-72.9864	457						

Pole descriptions:

42/47-foot wood utility poles are 50/55-foot poles, planted 8'. A mast can raise a small antenna to the 52-56-foot wood utility poles are 80-foot poles, planted 15'.

90-foot towers are 90-foot (above ground) monopoles. Antennas generally attach to mounting hardware of


Notes

Foot of Johnnycake Hill
OnTown Hill near 199
Near 147 Chipman
Near Glendale
Near 128 E River
1.1 mi. N of Town Hill Rd
Near 54 Skyline
P/S tower (planned)
Near 87 Town Hill
Near 101 Chipman
Primary access site
Serves Becket Rd. area
Below Alderman
Near 83 Cone

Budgeted only

Likely relay to Bancroft area
Relay to East River S

Optional redundant

5 foot level.

ffset from the sides, below the top.

Middlefield Wireless Broadband Monthly Operating Expenses

Operator fees:		Fee	Quantity	Total
Subscriber		\$25	173	\$4,325
Access point		\$25	29	\$725
Backhaul link		\$25	17	\$425
Total	\$5,475			

Insurance \$500 (estimated)

Upstream ISP \$1,400 (100-150 Mbps)

Consulting support \$500 (ongoing average, not retainer)

MLP management (PT) \$1,000

Electricity \$250

Break/fix replacements \$879

Electronics depreciation \$3,517

Tower/pole depreciation \$289

Per User Break Even:		Number of Users		
		150	200	173
Monthly "fiscal" total	\$13,810	\$92.07	\$69.05	\$79.83
Monthly "cash" total	\$10,004	\$66.70	\$50.02	\$57.83

Electronics depreciation months 60

Infrastructure depreciation months 360

Break/fix % per year of capex 5%